

WHAT IS CLAIMED IS:

- 1 1. An apparatus comprising:
2 a first system of microfabricated components including at least a reservoir and a
3 channel; and
4 a second system of detection components including at least a lens, said lens being
5 focused on a region (hereinafter "sensing platform") of said first system,
6 said region being coupled to said reservoir by said channel.
- 1 2. The apparatus as set forth in claim 1, wherein the second system includes a
2 fluorescence detection system.
- 1 3. The apparatus as set forth in claim 1, wherein the second system includes a
2 laser, said laser being positioned to illuminate a sample in the sensing platform.
- 1 4. The apparatus as set forth in claim 1, wherein the first system further
2 comprises a pump.
- 1 5. The apparatus as set forth in claim 4, wherein the pump is electro-magnetically
2 actuated.
- 1 6. The apparatus as set forth in claim 4, wherein the pump is piezoelectrically
2 actuated.
- 1 7. The apparatus as set forth in claim 1, wherein the first system further
2 comprises a valve.
- 1 8. The apparatus as set forth in claim 1, further comprising a thermoelectric
2 cooler positioned to control the temperature of at least one of the microfabricated
3 components.
- 1 9. The apparatus as set forth in claim 1, further comprising at least one driver
2 unit coupled to provide control signals to at least one of the microfabricated components.

1 10. The apparatus as set forth in claim 1, wherein the first system is disposable.

1 11. The apparatus as set forth in claim 1, wherein the first system further
2 comprises a mixer.

1 12. The apparatus as set forth in claim 11, wherein the mixer includes a nozzle
2 positioned to inject a first substance into a chamber containing a second substance.

1 13. The apparatus as set forth in claim 1, wherein the first system further
2 comprises a filter.

1 14. The apparatus as set forth in claim 1, wherein at least a portion of the
2 microfabricated components are etched in a silicon substrate.

1 15. The apparatus as set forth in claim 1, wherein at least a portion of the
2 microfabricated components are formed in a polymer substrate.

1 16. A biosensor system for processing a sample and detecting one or more target
2 substances in the sample, comprising:

3 a data processing and control unit;

4 a microfluidic system coupled to communicate with the data processing and
5 control unit, wherein the microfluidic system includes microfabricated
6 components;

7 a detection system coupled to receive a processed sample from the microfluidic
8 system and transmit signals regarding the target substances to the data
9 processing and control unit; and

10 a handheld housing including the data processing and control unit, the
11 microfluidic system, and the detection system.

1 17. The system as set forth in claim 16, further comprising a user interface
2 coupled to receive input from a user and provide output to the user, the user interface
3 being further coupled to provide the input from the user to the data processing and
4 control unit.

1 18. The system as set forth in claim 17, wherein the output to the user includes
2 information regarding the target substances.

1 19. The system as set forth in claim 17, wherein the input from the user includes
2 information regarding the processing to be performed on the sample.

1 20. The system as set forth in claim 16, wherein the data processing and control
2 unit processes information from the detection system.

1 21. The system as set forth in claim 16, wherein the data processing and control
2 unit includes one or more driver units coupled to control operation of the components in
3 the microfluidic system.

1 22. The system as set forth in claim 16, wherein the data processing and control
2 unit includes one or more driver units coupled to control operation of the detection
3 system.

1 23. The system as set forth in claim 16, further comprising a thermo-electric
2 cooler for heating and cooling the sample during processing.

1 24. The system as set forth in claim 16, wherein the microfabricated components
2 include one or more pumps.

1 25. The system as set forth in claim 24, wherein at least one of the pumps is
2 electro-magnetically actuated.

1 26. The system as set forth in claim 24, wherein at least one of the pumps is
2 piezoelectrically actuated.

1 27. The system as set forth in claim 16, wherein the microfabricated components
2 include one or more mixers.

1 28. The system as set forth in claim 27, wherein the one or more mixers include a
2 nozzle for injecting a first substance into a chamber containing the sample.

1 29. The system as set forth in claim 16, wherein the microfabricated components
2 include one or more filters.

 30. The system as set forth in claim 16, wherein the microfabricated components
include one or more valves.

1 31. A method for purifying and detecting one or more target substances in a
2 sample using a handheld biosensor system, the method comprising:
3 processing the sample using microfabricated components in the biosensor system;
4 transferring the processed sample to a sensing platform in the biosensor system;
5 and
6 detecting the one or more target substances on the sensing platform using a
7 detection system in the biosensor system.

1 32. The method as set forth in claim 31, wherein the processing includes
2 concentrating the sample.

1 33. The method as set forth in claim 31, wherein the processing includes filtering
2 the sample.

1 34. The method as set forth in claim 27, wherein the processing includes heating
2 the sample.

1 35. The method as set forth in claim 31, wherein the processing includes
2 pumping the sample into a reservoir and mixing the sample with a reagent.

1 36. The method as set forth in claim 31, wherein the processing includes washing
2 the sample.

1 37. The method as set forth in claim 31, wherein the processing includes
2 generating driver signals for controlling the microfabricated components.

1 38. The method as set forth in claim 31, wherein the processing includes
2 processing the sample for detecting a toxin.

1 39. The method as set forth in claim 31, wherein the processing includes
2 processing the sample for detecting bacteria.

1 40. The method as set forth in claim 31, wherein the processing includes
2 processing the sample for detecting a virus.

1 41. The method as set forth in claim 31, wherein the processing includes
2 processing the sample for detecting genetic characteristics.

1 42. The method as set forth in claim 31, wherein the detecting includes
2 illuminating the sample using a laser light source.

1 43. The method as set forth in claim 31, wherein the detecting includes
2 illuminating the sample using a laser light source.

1 44. The method as set forth in claim 31, wherein the detecting includes detecting
2 fluorescence of the processed sample.

1 45. The method as set forth in claim 31, further comprising:
2 communicating detection information to a data processing system within the
3 biosensor device.

1 46. A device for sensing a target substance in a sample comprising means for
2 implementing the method of claim 31.